bürkert
FLUID CONTROL SYSTEMS

Type 2103, 2104, 2105

Piston-controlled Diaphragm Valve
Kolbengesteuertes Membranventil
Vanne à membrane commandée par piston

Operating Instructions

Bedienungsanleitung
Manuel d'utilisation

MAN 1000099061 ML Version: H Status: RL (released | freigegeben) printed: 22.09.2015

We reserve the right to make technical changes without notice.
Technische Änderungen vorbehalten.
Sous réserve de modifications techniques.

© Bürkert Werke GmbH, 2008 - 2015

Operating Instructions 1509/07_EU-ML_00805642 / Original DE

MAN 1000099061 ML Version: H Status: RL (released | freigegeben) printed: 22.09.2015

1 OPERATING INSTRUCTIONS 4
1.1 Symbols 4
1.2 Definition of term “product” 4
2 AUTHORIZED USE 5
2.1 Restrictions 5
3 BASIC SAFETY INSTRUCTIONS 5
4 GENERAL INFORMATION 6
4.1 Contact address 6
4.2 Warranty 6
4.3 Information on the internet 6
5 PRODUCT DESCRIPTION 7
5.1 General description 7
5.2 Versions 7
5.3 Options 7
5.4 Designated application area 8
6 STRUCTURE AND FUNCTION 8
6.1 Structure 8
6.2 Function 10
7 TECHNICAL DATA 11
7.1 Conformity 11
7.2 Standards 11
7.3 Type label 11
7.4 Operating conditions 12
7.5 Flow values and characteristics 21
7.6 General technical data 27
8 INSTALLATION 28
8.1 Installation position general 28
8.2 Installation position 2/2-way valve type 2103 28
8.3 Installation position T-valve type 2104 29
8.4 Installation position tank bottom valve type 2105 29
8.5 Before installation 29
8.6 Installation 30
8.7 Pneumatic connection 33
8.8 Removal 34
9 ELECTRICAL CONTROL UNIT 34
10 MAINTENANCE, CLEANING 35
10.1 Maintenance work 35
11 REPAIRS 37
11.1 Replacing the diaphragm 37
12 MALFUNCTIONS 40
13 REPLACEMENT PARTS 40
13.1 Order table 41
14 PACKAGING, TRANSPORT, STORAGE 42

1 OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the product. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the product.

The operating instructions contain important safety information.

Failure to observe these instructions may result in hazardous situations.

- The operating instructions must be read and understood.

1.1 Symbols

DANGER!

Warns of an immediate danger.

- Failure to observe the warning may result in a fatal or serious injury.

WARNING!

Warns of a potentially dangerous situation.

- Failure to observe the warning may result in serious injuries or death.

CAUTION!

Warns of a possible danger.

- Failure to observe this warning may result in a moderately severe or minor injury.

NOTE!

Warns of damage to property.

- Failure to observe the warning may result in damage to the product or the equipment.

Indicates important additional information, tips and recommendations.

Refers to information in these operating instructions or in other documentation.

- Designates an instruction to prevent risks.

→ Designates a procedure which you must carry out.

1.2 Definition of term “product”

The term “product” used in these instructions always stands for the diaphragm valve Type 2103, 2104 or 2105.

2 AUTHORIZED USE

Non-authorized use of the diaphragm valve Type 2103, 2104 or 2105 may be a hazard to people, nearby equipment and the environment.

- The product is designed for the controlled flow of liquid media.
- In the potentially explosion-risk area the diaphragm valve may be used only according to the specification on the separate Ex type label. For use observe the additional information enclosed with the product together with safety instructions for the explosion-risk area.
- Devices without a separate Ex type label may not be used in a potentially explosive area.
- The admissible data, the operating conditions and conditions of use specified in the contract documents, operating instructions and on the label are to be observed during use. The designated application cases are specified in the chapter entitled "5 Product description".
- The product may be used only in conjunction with third-party products and components recommended and authorised by Bürkert.
- Correct transportation, correct storage and installation and careful use and maintenance are essential for reliable and fault-less operation.
- Use the product only as intended.

2.1 Restrictions

If exporting the system or product, observe any existing restrictions.

3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any

- contingencies and events which may arise during the installation, operation and maintenance of the products.
- local safety regulations, whereby the operator is responsible for their compliance, by the installation personnel too.

Danger – high pressure.

- Before dismounting the lines and valves, turn off the pressure and vent the lines.

Risk of electric shock.

- Before reaching into the product, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

Risk of injury when opening the actuator.

The actuator contains a tensioned spring. If the actuator is opened, there is a risk of injury from the spring jumping out.

- The actuator must not be opened.

Risk of injury from moving parts in the device.

- Do not reach into openings.

Risk of burns and risk of fire if used continuously through hot device surface.

- Do not touch the product with bare hands.

General hazardous situations.

To prevent injury, ensure that:

- The system cannot be activated unintentionally.
- Installation and repair work may be carried out by authorized technicians only and with the appropriate tools.
- After an interruption in the power supply or pneumatic supply, ensure that the process is restarted in a defined or controlled manner.
- The product may be operated only when in perfect condition and in consideration of the operating instructions.
- The general rules of technology apply to application planning and operation of the product.

To prevent damage to property on the product, ensure:

- Supply the media connections only with those media which are specified as flow media in the chapter entitled "7 Technical data".
- Do not put any loads on the valve (e.g. by placing objects on it or standing on it).
- Do not make any external modifications to the valves. Do not paint the body parts or screws.

4 GENERAL INFORMATION

4.1 Contact address

Germany

Bürkert Fluid Control Systems
Sales Center
Chr.-Bürkert-Str. 13-17
D-74653 Ingelfingen
Tel. : + 49 (0) 7940 - 10 91 111
Fax : + 49 (0) 7940 - 10 91 448
E-mail: info@de.burkert.com

International

Contact addresses are found on the final pages of the printed operating manual.

You can also find information on the Internet under:

www.burkert.com

4.2 Warranty

The warranty is only valid if the product is used as authorized in accordance with the specified application conditions.

4.3 Information on the internet

The operating instructions and data sheets for Type 2103, 2104 and 2105 can be found on the Internet at: www.burkert.com

5 PRODUCT DESCRIPTION

5.1 General description

The piston-controlled diaphragm valve Type 2103, 2104 or 2105 is suitable for liquid media.

Using neutral gases or air (control media), it controls the flow of dirty, aggressive, abrasive, ultrapure or sterile media, even highly viscous media can be used (flow media).

5.1.1 Properties

- Any flow direction.
- Self-draining for appropriate installation. The ends of the utilized connections must be cylindrical.
- Free of empty space.
- Low-turbulence flow.
- High flow values by the streamlined valve body.
- Maintenance-free under normal conditions.
- PTFE/EPDM diaphragms can be easily replaced with EPDM membranes.

5.2 Versions

There are 2 versions of the type 2103, 2104 and 2105.

- **Standard version – without separate Ex type label.**
  The standard version must not be used in the potentially explosive area.
- **Ex version – with separate Ex type label.**
  The Ex version may be used in the potentially explosive area. In doing so, observe the specifications on the separate Ex type label and the additional information enclosed with the device together with safety instructions for the Ex area.

5.2.1 Product versions

Actuator sizes

The piston-controlled diaphragm valve is available for the following actuator sizes:

ø 50 mm, ø 70 mm, ø 90 mm, ø 130 mm.

Pilot pressure

Designs with lower pilot pressure (reduced spring force) are available on request.

Contact your Bürkert sales office or our Sales Center, e-mail: info@de.buerkert.com

5.3 Options

- Control unit
  Different versions of the activation units are available depending on the requirement.
- Stroke limitation
  Limit of the maximum open position / flow rate by means of adjusting screw.
- Feedback indicator
  The product features mechanical limit switches or inductive proximity switches.

5.4 Designated application area

The diaphragm valve has been designed for use with dirty, aggressive, abrasive, ultrapure or sterile media. The valves may only control media which do not corrode the body and the seal materials (see type label).

Observe the maximum pressure range according to the type label!

- Dirty, aggressive, abrasive, ultrapure or sterile media.
- Highly viscous media.

5.4.1 Application areas

e.g. plant construction
luxury food and food processing industry
bottling plant
chemical engineering
pharmaceutics
biotechnology

6 STRUCTURE AND FUNCTION

6.1 Structure

The piston-controlled diaphragm valve consists of a pneumatically operated piston actuator and a 2/2-way valve body.

The actuator is manufactured from polyphenylene sulphide (PPS) / stainless steel.

6.1.1 2/2-way valve type 2103

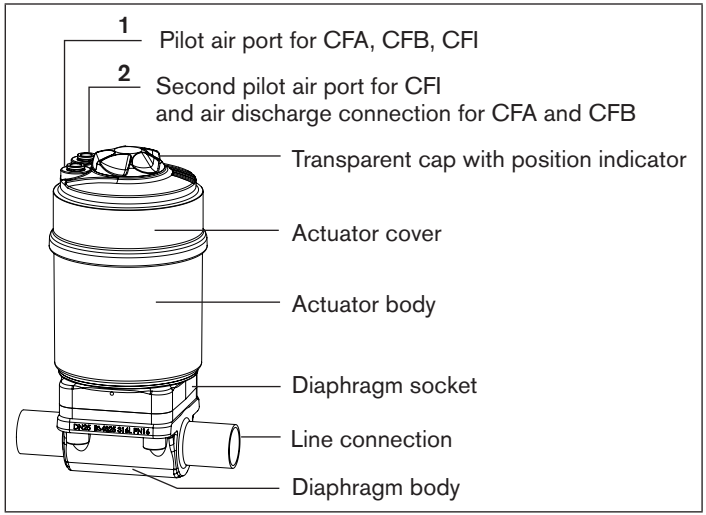


Fig. 1: Structure and description type 2103

6.1.2 T-valve type 2104

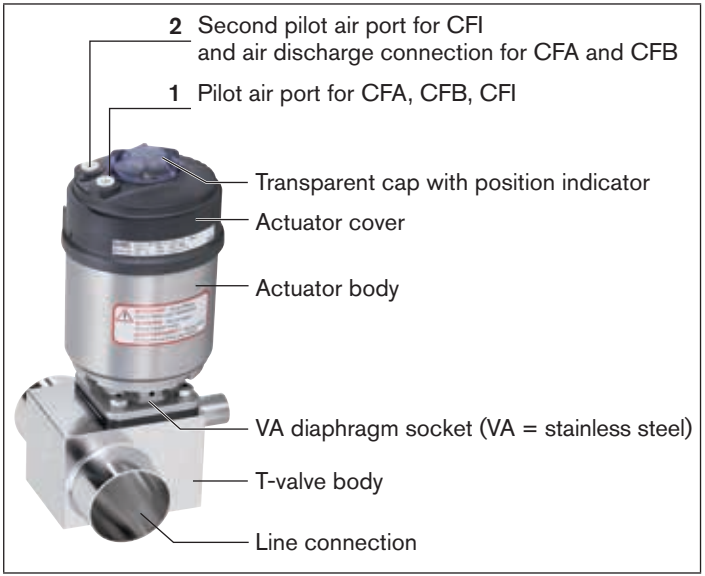

2 Second pilot air port for CFI
and air discharge connection for CFA and CFB
1 Pilot air port for CFA, CFB, CFI
Transparent cap with position indicator
Actuator cover
Actuator body
VA diaphragm socket (VA = stainless steel)
T-valve body
Line connection

Fig. 2: Structure and description type 2104

6.1.3 Tank bottom valve type 2105

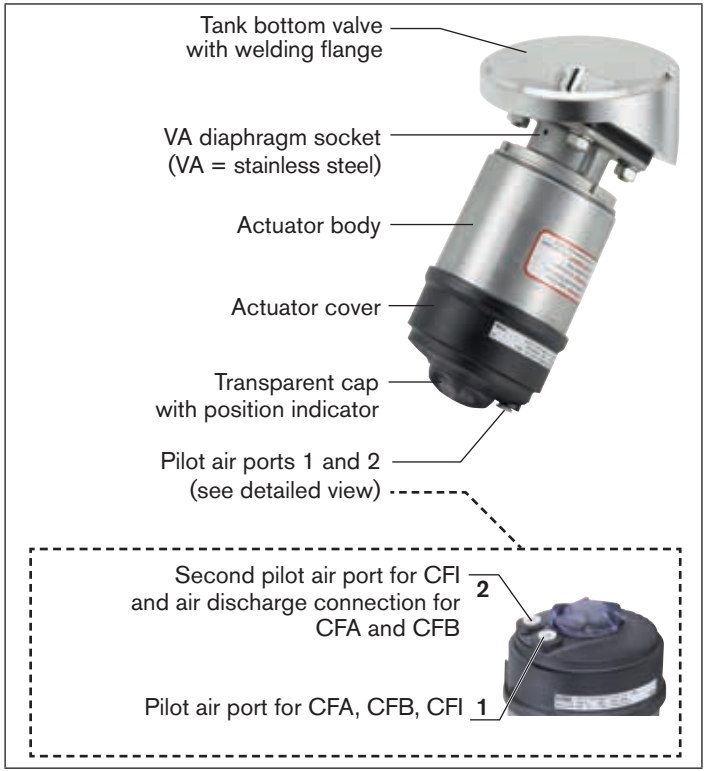


Fig. 3: Structure and description type 2105

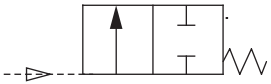
6.2 Function

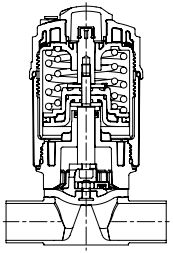
Spring force (CFA) or pneumatic pilot pressure (CFB and CFI) generates the closing force on the diaphragm pressure piece. The force is transferred via a spindle which is connected to the actuator piston.

6.2.1 Control functions (CF)

Control function A (CFA)

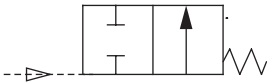
Normally closed by spring action

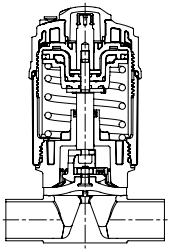




Control function B (CFB)

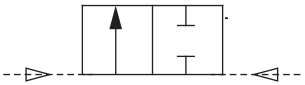
Normally open by spring action

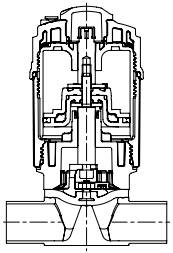




Control function I (CFI)

Actuating function via reciprocal pressurization.





WARNING!

For control function I – Danger if pilot pressure fails.

For control function I control and resetting occur pneumatically. If the pressure fails, no defined position is reached.

- ▸ To ensure a controlled restart, first pressurize the product with pilot pressure, then switch on the medium.

7 TECHNICAL DATA

WARNING!

Risk of injury from high pressure.

Important product-specific technical specifications are indicated on the type label.

- Observe permitted pressure range on the type label of the product.

7.1 Conformity

Type 2103, 2104 and 2105 conforms with the EC Directives according to the EC Declaration of Conformity.

7.2 Standards

The applied standards, which verify conformity with the EC Directives, can be found on the EC-Type Examination Certificate and / or the EC Declaration of Conformity.

7.3 Type label

Example:

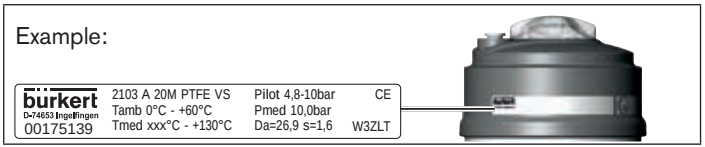
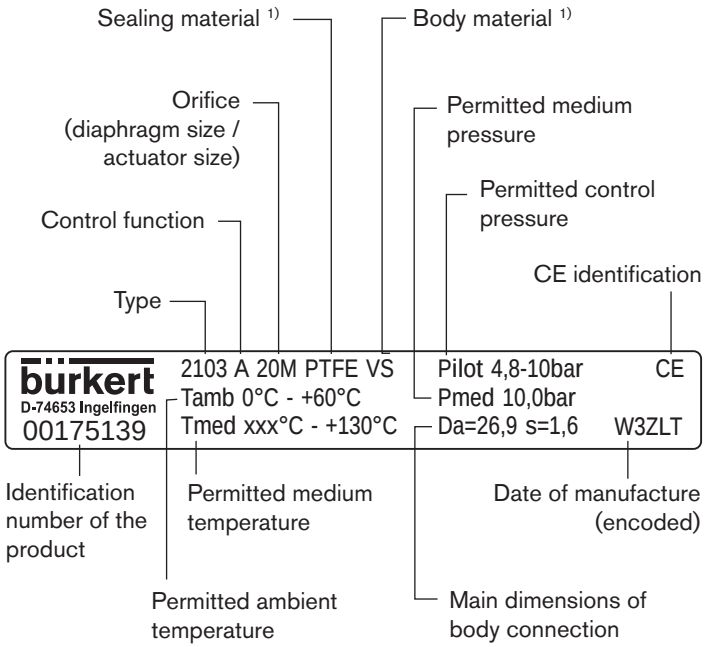


Fig. 4: Example of type label

7.3.1 Wording on the type label

Example:



1) *For description of versions see "7.4 Operating conditions"*

7.3.2 Labeling of the forged bodies

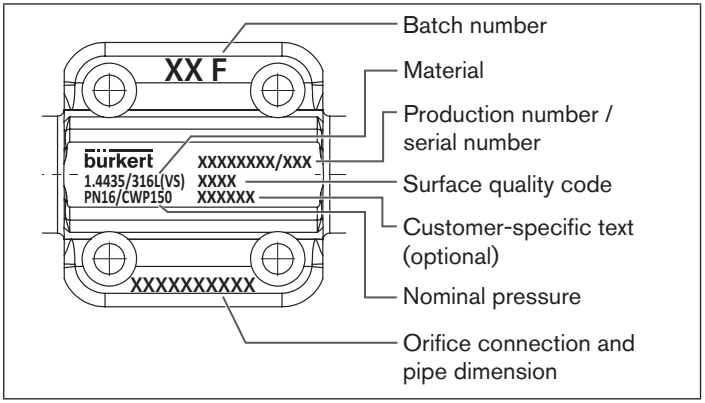


Fig. 5: Labeling of the forged bodies

7.4 Operating conditions

7.4.1 Temperature ranges

Permitted ambient temperature actuators

Actuator size	Actuator material	Environment[2)]
ø 50 mm	PPS	0...+60 °C[3)] 0...+100 °C[4)]
ø 70 mm		
ø 90 mm		
ø 130 mm		

Tab. 1: Permitted ambient temperature Actuators

2) If using a pilot valve / control unit, observe its temperature range.

Permitted medium temperature for body

Body material		Medium
Cast body (VG)	1.4435 (AISI 316L)	-10...+150 °C
Forged body (VS)	1.4435 BN2 (AISI 316L) according to ASME BPE 1997	

Tab. 2: Permitted medium temperature for body

3) Pilot air ports with push-in connector
4) Pilot air ports with threaded bushing

Permitted medium temperature for diaphragms

The indicated medium temperatures apply only to media which do not corrode or swell the diaphragm materials.

The behavior of the medium with respect to the diaphragm may be changed by the medium temperature.

The function properties, in particular the service life of the diaphragm, may deteriorate if the medium temperature increases.

Do not use the diaphragms as steam shut-off element.

Material	Temperature	Remarks
EPDM (AB)	-10...+130 °C	Steam sterilisation up to +140 °C / 60 min
EPDM (AD)	-5...+143 °C	Steam sterilisation up to +150 °C / 60 min
FKM (FF)	0...+130 °C	No steam / dry heat up to +150 °C / 60 min
PTFE (EA)	-10...+130 °C	Steam sterilisation up to +140 °C / 60 min
Advanced PTFE (EU)	-5...+143 °C	Steam sterilisation up to +150 °C / 60 min
Advanced PTFE (ET)	-10...+90 °C	-
Gylon (ER)	-5...+130 °C	Steam sterilisation up to +140 °C / 60 min

Tab. 3: Permitted medium temperature for diaphragms

7.4.2 Pressure ranges

Pilot pressure for valves with pneumatic position controller

To ensure reliable operation with pneumatic position controller, observe the permitted minimum and maximum pilot pressure on the type label.

Actuator size	Pilot pressure
ø 50 mm	5.5 – 7.0 bar
ø 70 mm	
ø 90 mm	
ø 130 mm	

Tab. 4: Pilot pressure for valves with pneumatic position controller

Maximum pilot pressure for valves without pneumatic position controller

Actuator size	Actuator material	max. permitted pilot pressure
ø 50 mm	PPS	10 bar
ø 70 mm		
ø 90 mm		
ø 130 mm		7 bar

Tab. 5: Maximum pilot pressure for valves without pneumatic position controller

Pilot pressure for control function A[5)]

Actuator size [mm]	Orifice DN [mm]	Pilot pressure [bar] for medium pressure 0 bar	Pilot pressure [bar] for medium pressure maximum
ø 50	8 EPDM/FKM	2.5	2.3
	8 PTFE	3.8	3.5
	15	4.5	4.2
ø 70	15	4.8	4.5
ø 70	20	4.8	4.5
ø 70	25	5.5	4.3
ø 90		5.0	4.0
ø 90	40	5.0	4.5
ø 130		5.0	4.6
ø 130	50	5.0	4.8

Tab. 6: Pilot pressure for control function A

Designs with lower pilot pressure (reduced spring force) are available on request.

Contact your Bürkert sales office or our Sales Center, e-mail: info@de.buerkert.com

Operating pressure for control function A[5)]

The values apply to body made of

- forged steel (VS)
- precision casting (VG)

Actuator size [mm]	Orifice DN [mm]	Max. sealed medium pressure [bar] Pressure on one side EPDM/FKM	Pressure on one side PTFE	Pressure on both sides EPDM/FKM	Pressure on both sides PTFE
ø 50	8	10	10	10	10
ø 50	15	7.5	5	5	3.5
ø 70	15	10	10	10	10
ø 70	20	10	10	10	7.5
ø 70	25	6.5	6	5.5	4.5
ø 90		10	8	10	7
ø 90	40	5.5	5	4	3
ø 130		10	10	10	9
ø 130	50	10	7	7	5

Tab. 7: Operating pressure for control function A

5) *The control functions are described in the chapter entitled "6.2.1 Control functions (CF)".*

Required minimum pilot pressure depending on medium pressure

The following graphs illustrate the required minimum pilot pressure depending on the medium pressure for control functions B and I.

The values apply to body made of

- forged steel (VS)
- precision casting (VG)

When using Type 2103, 2104 or 2105 as a control valve, pressure conditions may deviate in some cases. These conditions appear in the diagrams with a gray background.

Control function B / elastomer diaphragm

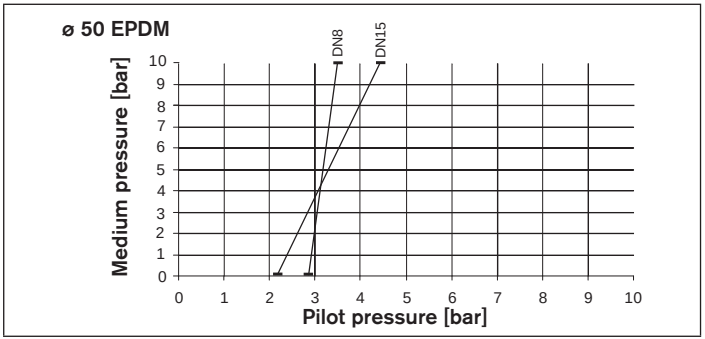


Fig. 6: Pressure graph, actuator ø 50 mm, control function B, elastomer diaphragm

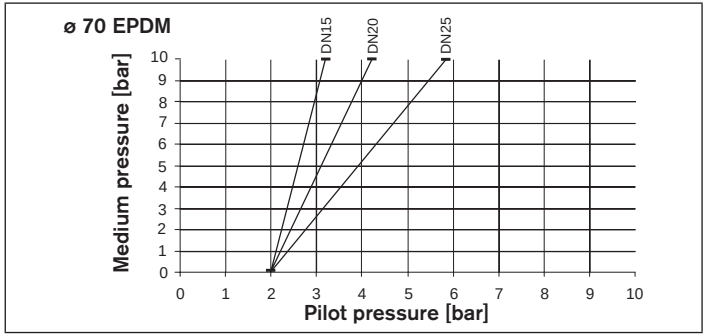


Fig. 7: Pressure graph, actuator ø 70 mm, control function B, elastomer diaphragm

Graph for control valve

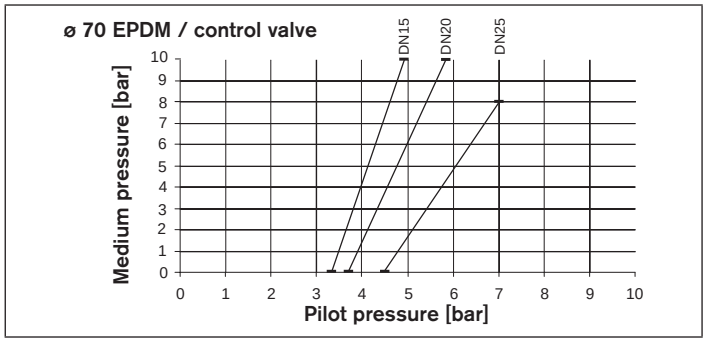


Fig. 8: Pressure graph for control valve, actuator ø 70 mm, control function B, elastomer diaphragm

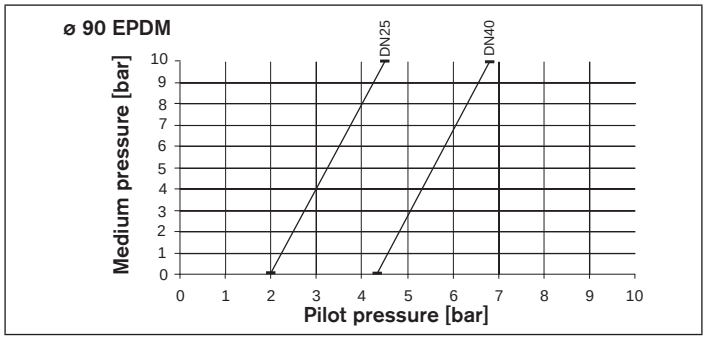


Fig. 9: Pressure graph, actuator ø 90 mm, control function B, elastomer diaphragm

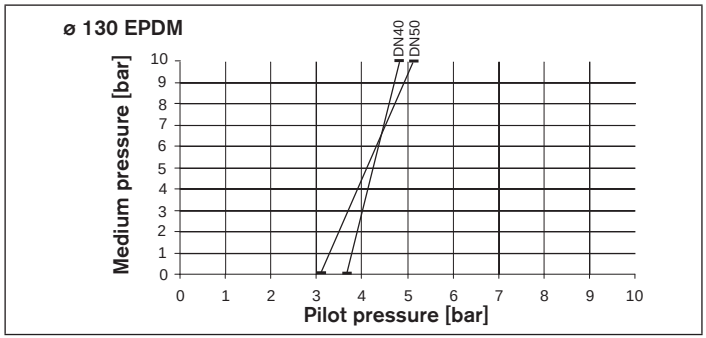


Fig. 11: Pressure graph, actuator ø 130 mm, control function B, elastomer diaphragm

Graph for control valve

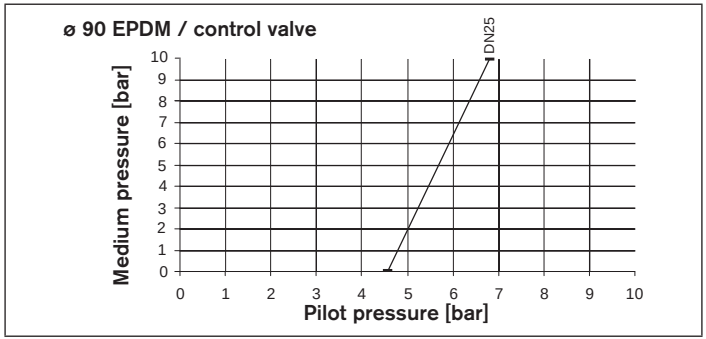


Fig. 10: Pressure graph for control valve, actuator ø 90 mm, control function B, elastomer diaphragm

Graph for control valve

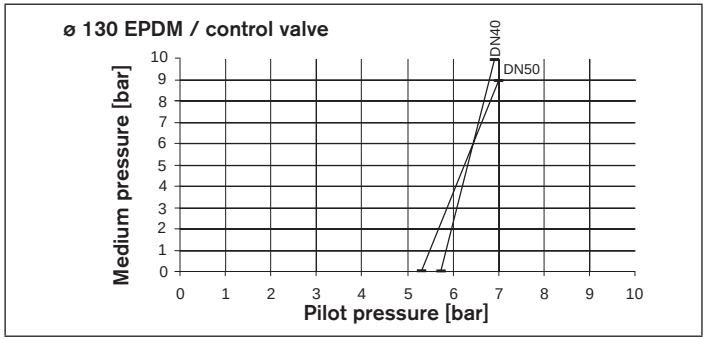


Fig. 12: Pressure graph for control valve, actuator ø 130 mm, control function B, elastomer diaphragm

Control function B / PTFE elastomer diaphragm

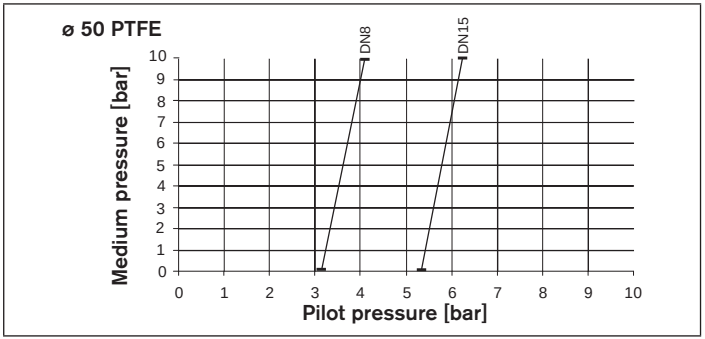


Fig. 13: Pressure graph, actuator ø 50 mm, control function B, PTFE elastomer diaphragm

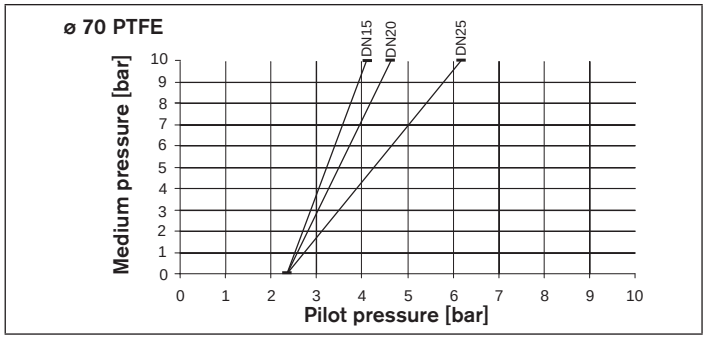


Fig. 14: Pressure graph, actuator ø 70 mm, control function B, PTFE elastomer diaphragm

Graph for control valve

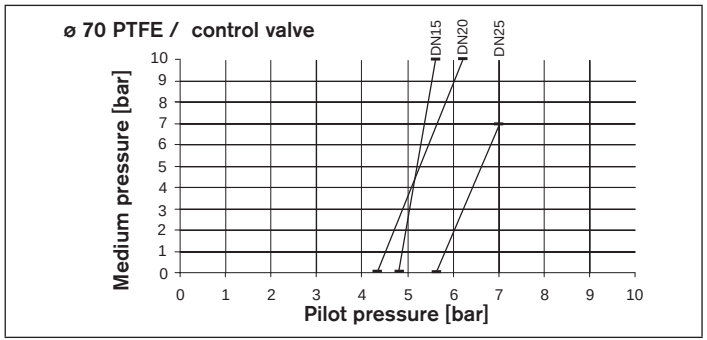


Fig. 15: Pressure graph for control valve, actuator ø 70 mm, control function B, PTFE elastomer diaphragm

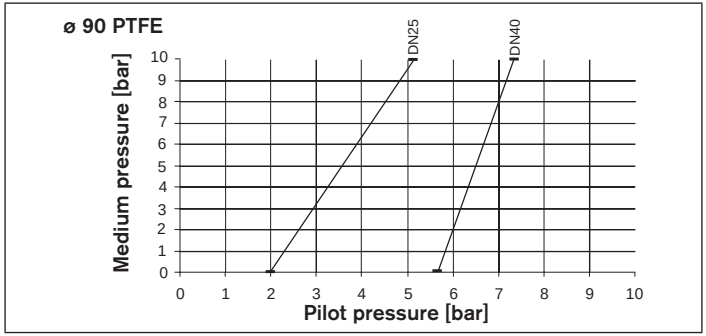


Fig. 16: Pressure graph, actuator ø 90 mm, control function B, PTFE elastomer diaphragm

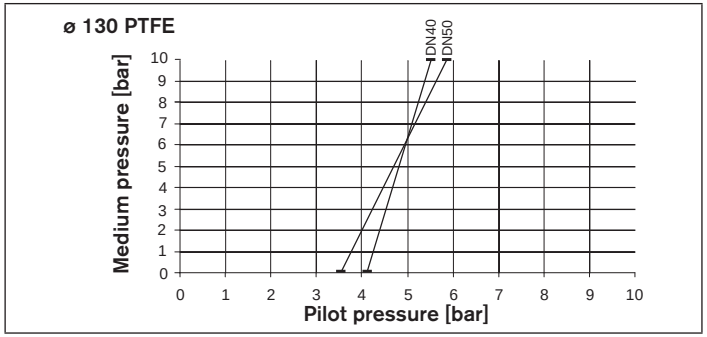


Fig. 18: Pressure graph, actuator ø 130 mm, control function B, PTFE elastomer diaphragm

Graph for control valve

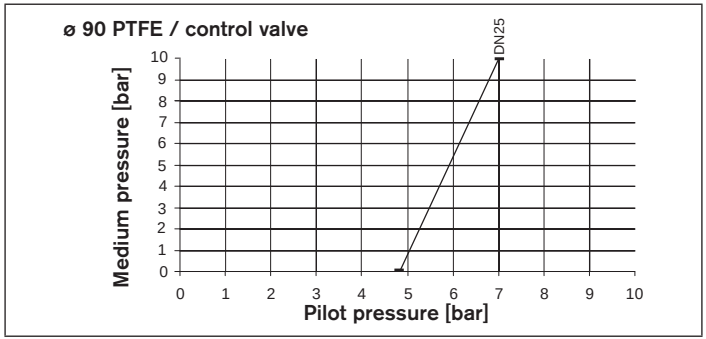


Fig. 17: Pressure graph for control valve, actuator ø 90 mm, control function B, PTFE elastomer diaphragm

Graph for control valve

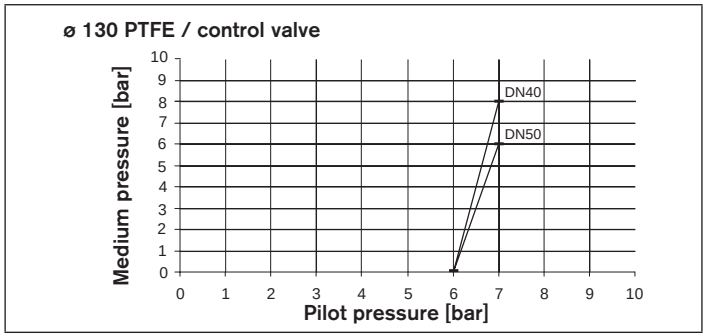


Fig. 19: Pressure graph for control valve, actuator ø 130 mm, control function B, PTFE elastomer diaphragm

Control function I / elastomer diaphragm

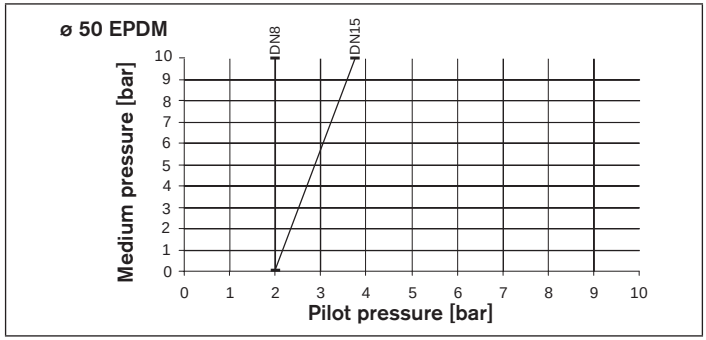


Fig. 20: Pressure graph, actuator ø 50 mm, control function I, elastomer diaphragm

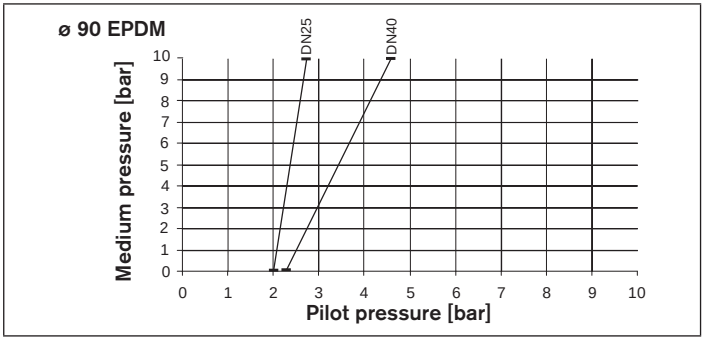


Fig. 22: Pressure graph, actuator ø 90 mm, control function I, elastomer diaphragm

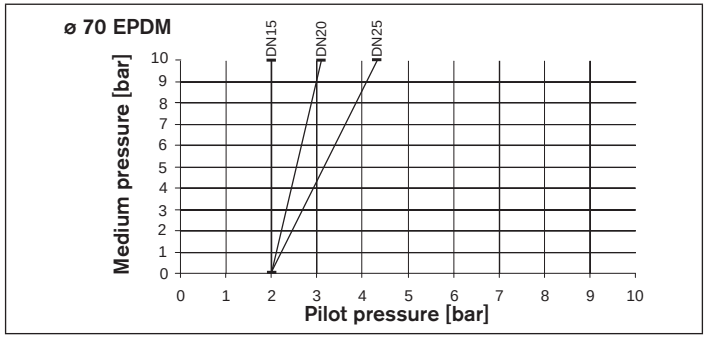


Fig. 21: Pressure graph, actuator ø 70 mm, control function I, elastomer diaphragm

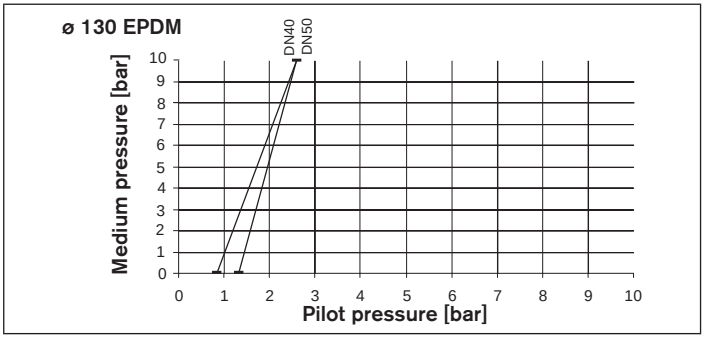


Fig. 23: Pressure graph, actuator ø 130 mm, control function I, elastomer diaphragm

Control function I / PTFE elastomer diaphragm

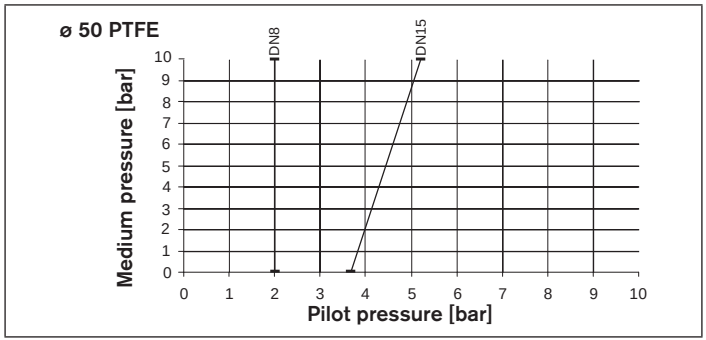


Fig. 24: Pressure graph, actuator ø 50 mm, control function I, PTFE elastomer diaphragm

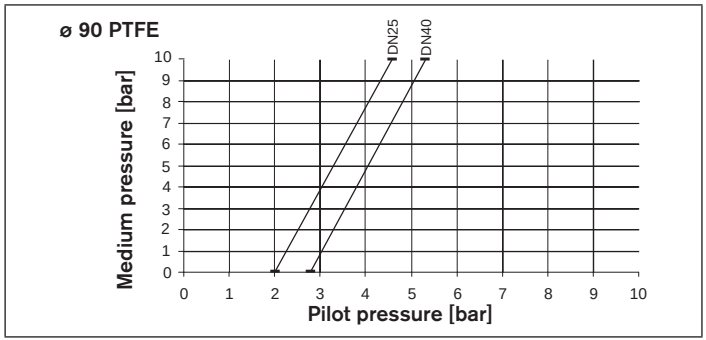


Fig. 26: Pressure graph, actuator ø 90 mm, control function I, PTFE elastomer diaphragm

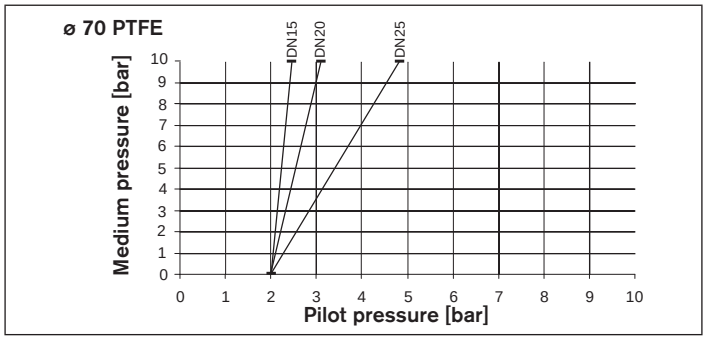


Fig. 25: Pressure graph, actuator ø 70 mm, control function I, PTFE elastomer diaphragm

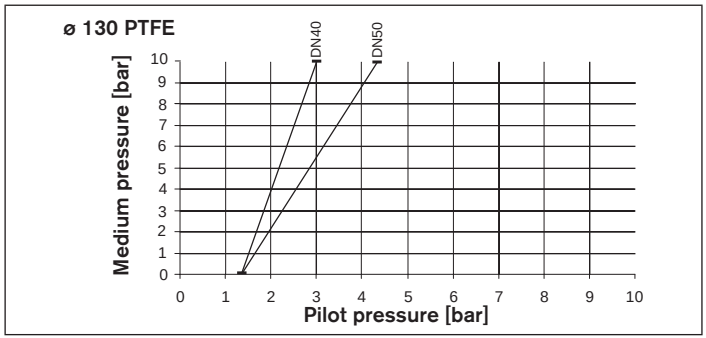


Fig. 27: Pressure graph, actuator ø 130 mm, control function I, PTFE elastomer diaphragm

7.5 Flow values and characteristics

(for valves with 2/2-way valve body)

Flow values for DN8

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
20	0	0	0.21	13	0	0	0.26	17
30	0.04	4	0.42	26	0	0	0.5	33
40	0.2	20	0.64	39	0.14	15	0.73	48
50	0.36	35	0.88	54	0.29	31	0.88	58
60	0.52	51	1.09	67	0.45	47	1.08	72
70	0.65	64	1.23	75	0.58	61	1.25	83
80	0.79	77	1.44	88	0.71	75	1.37	91
90	0.91	89	1.55	95	0.84	88	1.44	95
100	1.02	100	1.63	100	0.95	100	1.51	100

Tab. 8: Flow values for DN8

Flow characteristics for DN8

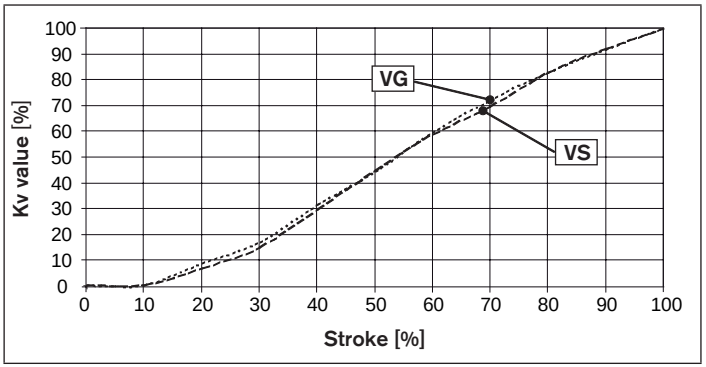


Fig. 28: Flow characteristics for DN8

Flow values for DN15

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	0.29	6	0.21	5	0.11	2	0.15	3
20	0.51	11	0.42	9	0.25	5	0.29	7
30	1.1	23	0.82	18	0.36	8	1.1	25
40	1.9	40	1.6	36	1.3	28	2	45
50	2.8	60	2.6	58	2.3	50	2.8	64
60	3.5	74	3.3	73	3.4	74	3.4	77
70	4.1	87	3.7	82	4	87	4	91
80	4.3	91	4.1	91	4.2	91	4	91
90	4.5	96	4.3	96	4.5	98	4.3	98
100	4.7	100	4.5	100	4.6	100	4.4	100

Tab. 9: Flow values for DN15

Flow characteristics for DN15

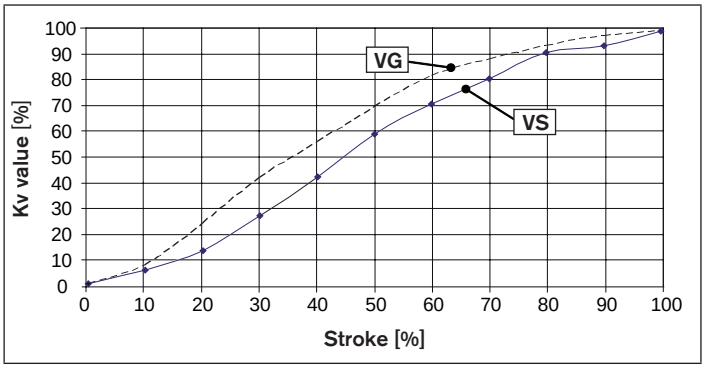


Fig. 29: Flow characteristics for DN15

Flow values for DN20

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	0.50	5	0.40	5	0.10	1	0.60	6
20	1.0	11	0.80	9	0.30	3	1.1	10
30	2.3	25	1.8	21	2.2	21	2.5	24
40	3.4	37	2.9	33	4.2	39	3.9	37
50	5.3	58	4.9	56	6.1	57	6.3	60
60	6.5	71	6.2	71	7.6	71	7.9	75
70	7.2	79	6.8	78	8.8	82	8.6	82
80	7.7	85	7.5	86	9.8	92	9.5	90
90	8.4	92	8.2	94	10.5	98	10.3	98
100	9.1	100	8.7	100	10.7	100	10.5	100

Tab. 10: Flow values for DN20

Flow characteristics for DN20

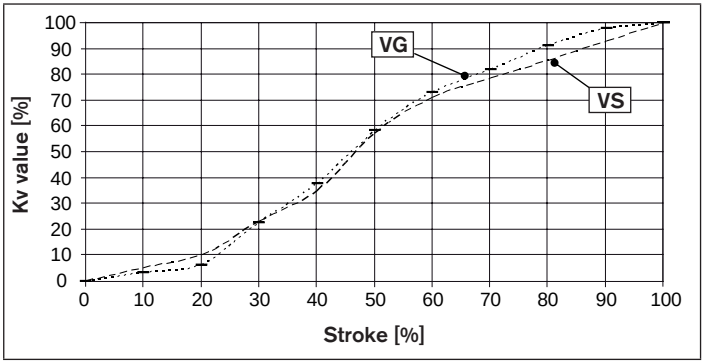


Fig. 30: Flow characteristics for DN20

Flow values for DN25

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	0.43	3	0.33	3	0.71	5	0.35	3
20	1.5	11	0.95	8	1.5	10	0.71	5
30	3.7	28	2.1	17	3.7	25	2.3	17
40	6.0	46	4.2	34	6.3	43	4.2	31
50	8.4	64	6.4	52	8.6	59	6.2	46
60	10.5	80	8.4	69	10.5	72	8.2	60
70	11.8	90	10.0	82	12.2	84	9.9	73
80	12.3	94	11.2	92	13.0	89	11.9	88
90	12.7	97	11.6	95	14.1	97	13.0	96
100	13.1	100	12.2	100	14.6	100	13.6	100

Tab. 11: Flow values for DN25

Flow characteristics for DN25

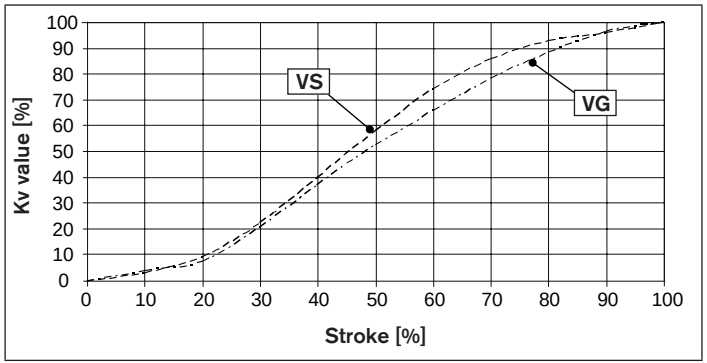


Fig. 31: Flow characteristics for DN25

Flow values for DN40

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	1.5	5	2.1	7	1.9	6	2.2	6
20	7.3	24	8.4	28	8.1	23	8.2	23
30	14.7	48	14.9	49	15.3	44	15.4	44
40	20.1	66	20.2	67	21.6	61	21.4	61
50	21	69	22.3	74	23.6	67	24.4	70
60	23	76	23.4	78	26.2	75	26.1	75
70	25.4	84	25.5	85	29.1	83	29	83
80	27.6	91	27.4	91	32.2	92	31.6	91
90	29.1	96	29	96	33.8	96	33.7	96
100	30.3	100	30.1	100	35.1	100	34.9	100

Tab. 12: Flow values for DN40

Flow characteristics for DN40

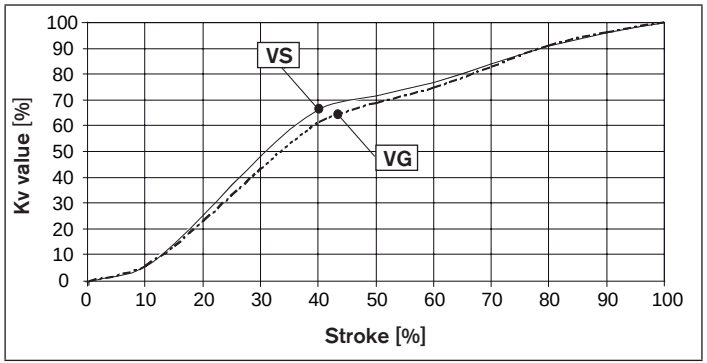


Fig. 32: Flow characteristics for DN40

Flow values for DN50

Stroke	Forged body (VS)				Cast body (VG)			
	EPDM		PTFE		EPDM		PTFE	
	Kv value							
	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]	[m³/h]	[%]
0	0	0	0	0	0	0	0	0
10	2.68	6	1.88	4	4.21	9	3.56	7
20	11.9	25	10.4	22	10.4	22	11.5	24
30	21.6	45	18.4	39	20.9	44	20.7	43
40	30.4	63	28	59	29.2	62	30.3	63
50	37.8	78	36.3	77	35.2	75	36.1	75
60	41.1	85	40	85	38	81	39.4	82
70	42.8	88	41.7	88	40.8	86	41.8	87
80	44.9	93	43.4	92	43.7	93	45.1	94
90	47.4	98	45.6	96	46	97	47.4	99
100	48.4	100	47.3	100	47.2	100	47.9	100

Tab. 13: Flow values for DN50

Flow characteristics for DN50

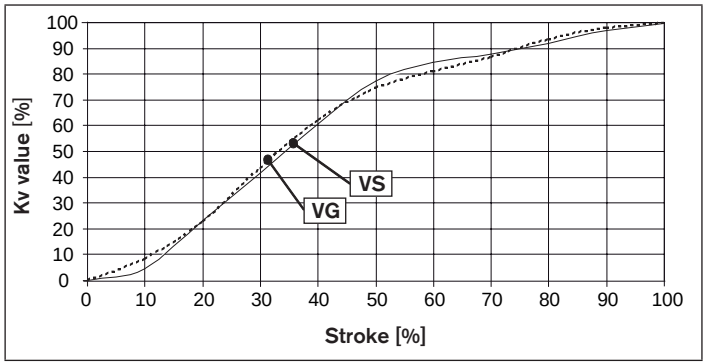


Fig. 33: Flow characteristics for DN50

7.6 General technical data

Control functions (CF)

Control function A	Normally closed by spring action
Control function B	Normally open by spring action
Control function I	Actuating function via reciprocal pressurization

Actuator sizes

ø 50 mm
ø 70 mm
ø 90 mm
ø 130 mm

Materials

Body type 2103	Precision casting (VG), forged steel (VS)
Body type 2104, 2105	VA block material
Actuator	PPS and stainless steel
Sealing elements	FKM and EPDM
Diaphragm	EPDM, PTFE, FKM

Connections

Pilot air connection	Plug-in hose connector 6/4 mm or 1/4” others on request
Medium connection	Weld end: in accordance with EN ISO 1127 (ISO 4200), DIN 11850 R2 other connections on request

Media

Control medium	Neutral gases, air
Flow media	Liquids; ultrapure, sterile, aggressive or abrasive media

Installation position

Type 2103, 2104	any position, preferably with the actuator face up.
Type 2105 (Tank bottom valve)	preferably with the actuator to the bottom

Degree of protection IP67 in accordance with IEC 529 / EN 60529

8 INSTALLATION

DANGER!

Danger – high pressure in the equipment.

- Before loosening the lines and valves, turn off the pressure and vent the lines.

WARNING!

Risk of injury from improper installation.

- Installation may be carried out by authorised technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and an uncontrolled restart.

- Secure system from unintentional activation.
- Following assembly, ensure a controlled restart.

For control function I – Danger if pilot pressure fails.

For control function I control and resetting occur pneumatically. If the pressure fails, no defined position is reached.

- To ensure a controlled restart, first pressurize the product with pilot pressure, then switch on the medium.

8.1 Installation position general

Installation for self-drainage of the body

It is the responsibility of the installer and operator to ensure self-drainage.

Installation for leakage detection

One of the bores (in the actuator base) for monitoring leakage must be at the lowest point.

8.2 Installation position 2/2-way valve type 2103

- The piston-controlled diaphragm valve can be installed in any installation position, preferably with the actuator face up.

To ensure self-drainage:

→ Install body inclined by an angle α = 10° to 40° to the horizontal. Forged and cast body: Mark on the body must point upwards (12 o'clock position, see "Fig. 34").

→ Observe an inclination angle of 1° – 5° to the line axis.

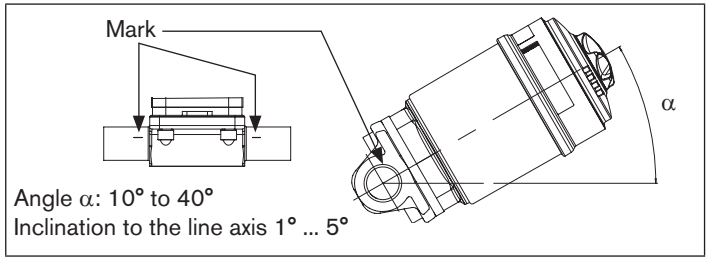


Fig. 34: Installation position for self-drainage of the body

8.3 Installation position T-valve type 2104

For the installation of the T-valves into circular pipelines, we recommend the following installation positions:

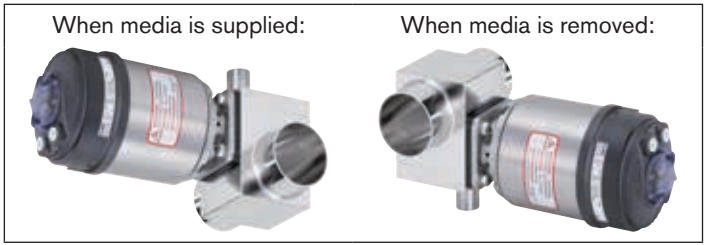


Fig. 35: Installation position type 2104

8.4 Installation position tank bottom valve type 2105

Preferably with the actuator to the bottom.

8.5 Before installation

- Before connecting the valve, ensure the pipelines are flush.
- The flow direction is optional.

8.5.1 Preparatory work

→ Clean pipelines (sealing material, swarf, etc.).

→ Support and align pipelines.

Products with VG/VS welded body:

NOTE!

Damage to the diaphragm or the actuator.

▸ Before welding in the body, remove the actuator.

Remove the actuator from the valve body:

NOTICE!

Damage to the diaphragm or the seat contour.

▸ When removing the actuator, ensure that the valve is in open position.

→ Control function A pressurize the pilot air port 1 with compressed air (5 bar): valve opens.

→ Remove actuator with diaphragm by loosening the body screws.

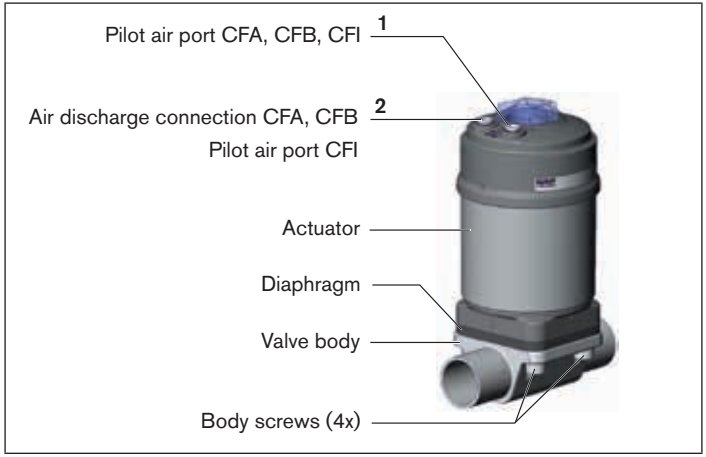


Fig. 36: Installation

8.6 Installation

If used in an aggressive environment, we recommend conveying all free pneumatic connections into a neutral atmosphere with the aid of a pneumatic hose.

WARNING!

Risk of injury from improper installation.

Non-observance of the tightening torque is dangerous as the product may be damaged.

▸ Observe the tightening torque (see “Tab. 14”).

8.6.1 Installation of the valve Type 2103 and 2104

Welded bodies

→ Weld valve body in pipeline system.

Other body versions

→ Connect body to pipeline.

8.6.2 Installation of the tank bottom valve Type 2105

It is recommended:

- To weld the valve prior to the container installation. However, it is possible to weld the valves to ready-assembled containers.
- To weld the valve in the center of the drain to ensure optimum draining of the container.

For further information on containers and welding instructions, please refer to the standard ASME VIII Division I.

Prior to welding, please check to ensure that:

- The tank bottom valve does not collide with other equipment components and assembly/disassembly of the actuator is always possible.
- A minimal distance between two welding joints three times the thickness of the container wall is adhered to.
- The hole diameter in the tank and the housing flange must be the same size. The housing flange has two welded edges to facilitate positioning and welding of the valve. The welded edges are approx.

3 mm wide. **If the container wall is more than 3 mm thick, it must be ground down so that the discharge surface is touching the housing flange surface.**

Prior to commencing the welding process, check the charge number indicated on the supplied manufacturer's certificate 3.1.B.

Observe the applicable laws and regulations of the respective country with regard to the qualification of welders and the execution of welding work.

Procedure:

→ Position the flange into the hole so that the flange surface is tangent to the drain surface.

→ Tack 4 welding points and check the position of the valve.

→ Weld the valve evenly to the inside and outside of the container, with gas being supplied and using welding material compatible with the valve's stainless steel 316L.

→ Allow the welds to cool down before burnishing and cleaning them according to the applicable specifications.

Observance of these instructions will prevent deformation and tension inside the containers.

8.6.3 Installation of the actuator (welded body)

Installation for actuator with control function A:

NOTICE!

Damage to the diaphragm or the seat contour!

▸ When installing the actuator, ensure that the valve is in open position.

→ Control function A pressurize the pilot air port 1 with compressed air (5 bar): valve opens.

→ Lightly cross-tighten the body screws until the diaphragm is between the body and actuator.
Do not tighten the screws yet.

→ Actuate the diaphragm valve twice.

→ Without pressurization tighten the body screws to the permitted tightening torque (see following table "Tab. 14: Tightening torques for diaphragms").

Installation for actuator with control functions B and I:

→ Lightly cross-tighten the body screws without pressurization until the diaphragm is between the body and actuator.
Do not tighten the screws yet.

→ Pressurize pilot air port 1 of the actuator with compressed air (5 bar).

→ Actuate the diaphragm valve twice.

→ Tighten the body screws to the permitted tightening torque (see "Tab. 14: Tightening torques for diaphragms").

Fig. 37: Pilot air port

Orifice DN (diaphragm size) [mm]	Tightening torques for diaphragms [Nm]	
	EPDM/FKM	PTFE / advanced PTFE / laminated advanced PTFE
8	2.5	2.5
15	3.5	4
20	4	4.5
25	5	6
40	8	10
50	12	15

Tab. 14: Tightening torques for diaphragms

8.6.4 Align actuator

If valves feature a VA diaphragm socket, the actuator for the valve body can be rotated steplessly by 360 °
(VA = stainless steel).

→ Rotate actuator using a hook wrench. See “Fig. 38”.

⚠ Rotate actuator only as far as required! (max. 360 °).

Recommended hook wrenches as per DIN 1810.

Actuator size:
ø 50 = A 52 - 55,
ø 70 - 130 = A 68 - 75

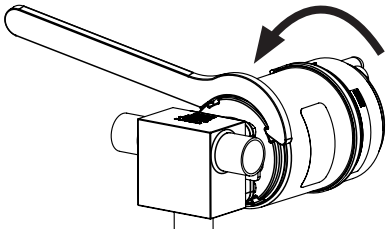


Fig. 38: Align actuator

8.7 Pneumatic connection

DANGER!

Danger – high pressure in the equipment.

- Before loosening the lines and valves, turn off the pressure and vent the lines.

WARNING!

Risk of injury from unsuitable connection hoses.

Hoses which cannot withstand the pressure and temperature range may result in hazardous situations.

- Use only hoses which are authorised for the indicated pressure and temperature range.
- Observe the data sheet specifications from the hose manufacturers.

For control function I – Danger if pilot pressure fails.

For control function I control and resetting occur pneumatically. If the pressure fails, no defined position is reached.

- To ensure a controlled restart, first pressurize the product with pilot pressure, then switch on the medium.

8.7.1 Connection of the control medium

Control functions A and B:

→ Connect the control medium to the pilot air port 1 of the actuator (see "Fig. 39: Pneumatic connection")

Silencer

For the versions with a plug-in connection the silencer for reducing the exhaust air noise is supplied loose.

→ Plug the silencer into the free air discharge connection 2 (see "Fig. 39: Pneumatic connection")

If used in an aggressive environment, we recommend conveying all free pneumatic connections into a neutral atmosphere with the aid of a pneumatic hose.

Control function I:

→ Connect the control medium to the pilot air port 1 and 2 of the actuator (see "Fig. 39: Pneumatic connection")
Pressure on connection 1 opens the valve.
Pressure on connection 2 closes the valve.

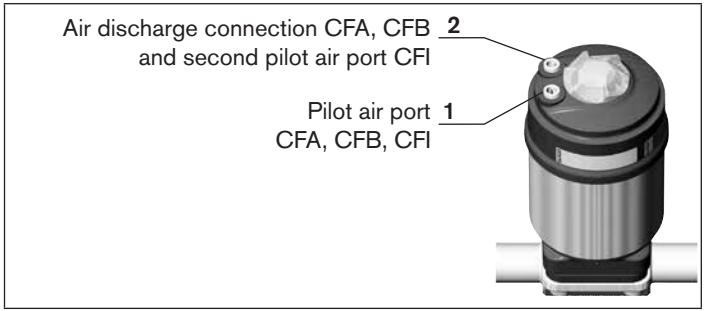


Fig. 39: Pneumatic connection

Control air hose:

Control air hoses of sizes 6/4 mm or 1/4" can be used.

Optionally a pilot air port is possible via a G 1/8 thread.

8.8 Removal

DANGER!

Risk of injury from discharge of medium and pressure!

It is dangerous to remove a product which is under pressure due to the sudden release of pressure or discharge of medium.

- ▸ Before removing a product, switch off the pressure and vent the lines.

Procedure:

→ Loosen the pneumatic connection.

→ Remove the product.

Replacement of the diaphragm is described in the chapter entitled “11 Repairs”.

9 ELECTRICAL CONTROL UNIT

The valve Type 2103, 2104 and 2105 can be combined with following control units:

- Type 8690 Pneumatic control unit (actuator size ∅ 70 - ∅ 130)
- Type 8697 Pneumatic control unit (actuator size ∅ 50)
- Type 8691 Control head (actuator size ∅ 70 - ∅ 130)
- Type 8695 Control head (actuator size ∅ 50)
- Type 8692 Positioner (actuator size ∅ 70 - ∅ 130)
- Type 8693 Process controller (actuator size ∅ 70 - ∅ 130)
- Type 8694 Positioner (actuator size ∅ 70 - ∅ 130)
- Type 8696 Positioner (actuator size ∅ 50)
- Type 8645 Automation system FreeLINE
- Type 6012 Pilot valve
- Type 6014 P Pilot valve

The electrical connection of the pilot valve or the control is described in the respective operating instructions for the pilot valve/control.

10 MAINTENANCE, CLEANING

DANGER!

Danger – high pressure in the equipment.

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of injury due to electrical shock.

- Before reaching into the system, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

WARNING!

Risk of injury from improper maintenance.

- Installation may be carried out by authorized technicians only and with the appropriate tools.

Risk of injury from unintentional activation of the system and an uncontrolled restart.

- Secure system from unintentional activation.
- Following maintenance, ensure a controlled restart.

WARNING!

For control function I – Danger if pilot pressure fails.

For control function I control and resetting occur pneumatically. If the pressure fails, no defined position is reached.

- To ensure a controlled restart, first pressurize the product with pilot pressure, then switch on the medium.

10.1 Maintenance work

10.1.1 Actuator

The actuator of the diaphragm valve is maintenance-free provided it is used according to these operating instructions.

10.1.2 Wearing parts of the diaphragm valve

Parts which are subject to natural wear:

- Seals
- Diaphragm

→ If leaks occur, replace the particular wearing part with an appropriate spare part.
(see chapter entitled “13 Replacement parts”).

A bulging PTFE diaphragm may reduce the flow.

The replacing of the wearing parts is described in chapter “11 Repairs”.

10.1.3 Inspection intervals

→ Check diaphragm for wear after maximum 10^5 switching cycles.

Muddy and abrasive media require correspondingly shorter inspection intervals!

10.1.4 Service life of the diaphragm

The service life of the diaphragm depends on the following factors:

- Diaphragm material
- Medium
- Medium pressure
- Medium temperature
- Actuator size
- Pilot pressure for CFB and CFI.

Protecting the diaphragm

→ For CFA match the actuator size (actuator force) to the medium pressure to be actuated. If required, select the actuator with reduced spring force EC04.

→ For CFB and CFI try and select the pilot pressure not higher than is required to actuate the medium pressure.

10.1.5 Cleaning

Commercially available cleaning agents can be used to clean the outside.

NOTE!

Avoid causing damage with cleaning agents.

- Before cleaning, check that the cleaning agents are compatible with the body materials and seals.

11 REPAIRS

DANGER!

Danger – high pressure in the equipment.

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of injury due to electrical shock.

- Before reaching into the system, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

WARNING!

Risk of injury from improper maintenance.

- Installation may be carried out by authorised technicians only and with the appropriate tools.
- Observe the tightening torques.
- On completion of the work check valve for leaks and function.

Risk of injury from unintentional activation of the system and an uncontrolled restart.

- Secure system from unintentional activation.
- Following maintenance, ensure a controlled restart.

WARNING!

For control function I – Danger if pilot pressure fails.

For control function I control and resetting occur pneumatically. If the pressure fails, no defined position is reached.

- To ensure a controlled restart, first pressurize the product with pilot pressure, then switch on the medium.

11.1 Replacing the diaphragm

Fastening types

Orifice DN (diaphragm size)	Fastening types for diaphragms	
	PTFE	EPDM / FKM
8	Diaphragm buttoned	Diaphragm buttoned
15	Diaphragm with bayonet catch	Diaphragm with bayonet catch
20		
25	Diaphragm with bayonet catch	Diaphragm screwed in
40		
50		

Tab. 15: Fastening types for diaphragms

DANGER!

Risk of injury from discharge of medium and pressure.

It is dangerous to remove a product which is under pressure due to the sudden release of pressure or discharge of medium.

- Before removing a product, switch off the pressure and vent the lines.

Replacement for control function A

→ Clamp the valve body in a holding product (applies only to valves not yet installed).

NOTICE!

Damage to the diaphragm or the seat contour.

- When removing the actuator, ensure that the valve is in open position.

→ Pressurize pilot air port **1** of the actuator with compressed air (5 bar): valve opens.

→ Loosen the four body screws.

→ Remove the actuator from the body.

→ Unbutton or unscrew old diaphragm. If attachment is with a bayonet catch, remove the diaphragm by rotating it through 90°. For orifice DN25-DN50 observe chapter "11.1.1".

→ Install new diaphragm.

→ Align diaphragm. **The marker flap of the diaphragm must be perpendicular to the direction of flow** (see "Fig. 40").

→ Place actuator back on the body.

→ Insert the body screws and lightly cross-tighten until the diaphragm is between the body and actuator.
Do not tighten the screws yet.

→ Actuate the diaphragm valve twice.

→ Without pressurization tighten the body screws to the permitted tightening torque (see "Tab. 16: Tightening torques for diaphragms").

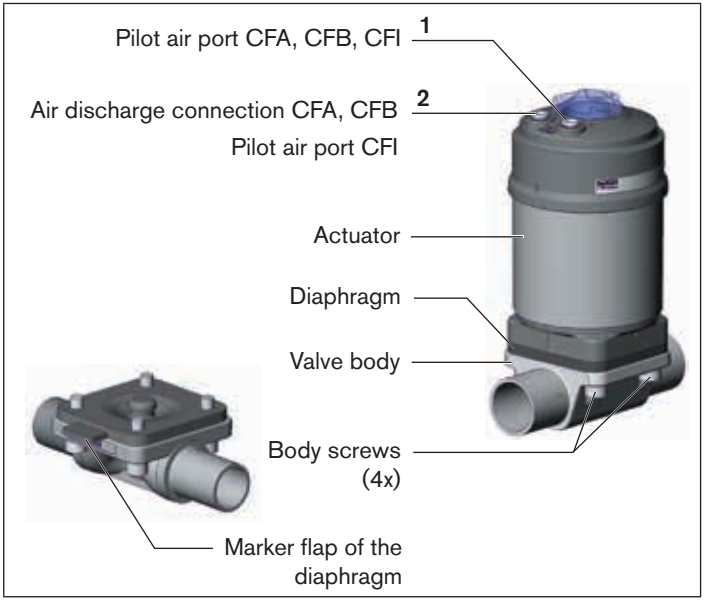


Fig. 40: Repairs

Replacement for control functions B and I

→ Clamp the valve body in a holding product. (applies only to valves not yet installed).

→ Loosen the four body screws.

→ Remove the actuator from the body.

→ Unbutton or unscrew old diaphragm. If attachment is with a bayonet catch, remove the diaphragm by rotating it through 90°. For orifice DN25-DN50 observe chapter "11.1.1".

→ Install new diaphragm.

→ Align diaphragm.
The marker flap of the diaphragm must be perpendicular to the direction of flow (see "Fig. 40")!

→ Place actuator back on the body.

→ Lightly cross-tighten the body screws without pressurization until the diaphragm is between the body and actuator.
Do not tighten screws yet.

→ Pressurize pilot air port **1** of the actuator with compressed air (5 bar) (see "Fig. 40").

→ Actuate the diaphragm valve twice.

→ Tighten the body screws to the permitted tightening torque (see "Tab. 16: Tightening torques for diaphragms").

Orifice DN (diaphragm size) [mm]	Tightening torques for diaphragms [Nm]	
	EPDM/FKM	PTFE / advanced PTFE / laminated advanced PTFE
8	2.5	2.5
15	3.5	4
20	4	4.5
25	5	6
40	8	10
50	12	15

Tab. 16: Tightening torques for diaphragms

11.1.1 Switch between PTFE and EPDM diaphragms

Orifice DN8:

→ Detach PTFE diaphragm and attach new EPDM diaphragm.

Orifice DN15 and DN20:

→ Loosen PTFE diaphragm bayonet and attach new EPDM diaphragm.

Orifice DN25 up to DN50:

→ Loosen PTFE diaphragm bayonet.

→ Place the insert in the pressure piece.

→ Insert and screw in EPDM diaphragm.

12 MALFUNCTIONS

Malfunction	Cause /remedial action
Actuator does not switch	Pilot air port interchanged[6)] CFA: Connecting pilot air port 1 CFB: Connecting pilot air port 1 CFI: Pilot air port 1: Open Pilot air port 2: Close
	Pilot pressure too low See pressure specifications on the type label.
	Medium pressure too high See pressure specifications on the type label.
Valve is not sealed	Medium pressure too high See pressure specifications on the type label.
	Pilot pressure too low See pressure specifications on the type label.
Flow rate reduced	PTFE diaphragm bulging → Replace diaphragm.

Tab. 17: Malfunctions

6) *see "Fig. 39: Pneumatic connection"*

13 REPLACEMENT PARTS

WARNING!

Risk of injury when opening the actuator.

The actuator contains a tensioned spring. If the actuator is opened, there is a risk of injury from the spring jumping out.

- The actuator must not be opened.

CAUTION!

Risk of injury and/or damage by the use of incorrect parts.

Incorrect accessories and unsuitable replacement parts may cause injuries and damage the product and the surrounding area.

- Use only original accessories and original replacement parts from Bürkert.

The diaphragm is available as a replacement part for the piston-controlled diaphragm valve Type 2103, 2104 and 2105.

If you have any queries, please contact your Bürkert sales office.

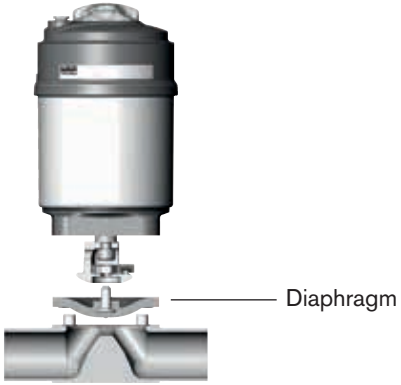


Fig. 41: Diaphragm replacement part

13.1 Order table

Orifice (Diaphragm size) [mm]	Order numbers for diaphragms					
	EPDM (AB*)		EPDM (AD*)		FKM (FF*)	
8	677 663	E02**	688 421	E03**	677 684	F01**
15	677 664	E02**	688 422	E03**	677 685	F01**
15 BC**	693 162	E02**	693 163	E03**	693 164	F01**
20	677 665	E02**	688 423	E03**	677 686	F01**
20 BC**	693 165	E02**	693 166	E03**	693 167	F01**
25	677 667	E01**	688 424	E03**	677 687	F01**
32	677 668	E01**	688 425	E03**	677 688	F01**
40	677 669	E01**	688 426	E03**	677 689	F01**
50	677 670	E01**	688 427	E03**	677 690	F01**
65	677 671	E01**	688 428	E03**	677 691	F01**
	PTFE (EA*)		Advanced PTFE (EU*)		Laminated advanced PTFE (ET*)	
8	677 674	L04**	679 540	L05**	677 694	L02**
15	677 675	E02-PTFE**	679 541	E02-PTFE+Hole**	677 695	L02**
20	677 676	E02-PTFE**	679 542	E02-PTFE+Hole**	677 696	L02**

25	677 677	E02-PTFE**	679 543	E02-PTFE+Hole**	677 697	L01**
32	677 678	E02-PTFE**	679 544	E02-PTFE+Hole**	–	
40	677 679	E02-PTFE**	679 545	E02-PTFE+Hole**	677 698	L01**
50	677 680	E02-PTFE**	679 546	E02-PTFE+Hole**	677 699	L01**
65	677 681	E02-PTFE**	679 743	E02-PTFE+Hole**	–	

Tab. 18: Order numbers for diaphragms

* *SAP Code*

** *Kennzeichnung auf der Membran*

14 PACKAGING, TRANSPORT, STORAGE

NOTE!

Transport damages.

Inadequately protected equipment may be damaged during transport.

- During transportation protect the product against wet and dirt in shock-resistant packaging.
- Avoid exceeding or dropping below the permitted storage temperature.

Incorrect storage may damage the product.

- Store the product in a dry and dust-free location.
- Storage temperature -20...+65 °C.

Damage to the environment caused by product components contaminated with media.

- Dispose of the product and packaging in an environmentally friendly manner.
- Observe applicable regulations on disposal and the environment.

bürkert
FLUID CONTROL SYSTEMS

www.burkert.com

MAN 1000099061 ML Version: H Status: RL (released | freigegeben) printed: 22.09.2015